As per the request from the Historical Use Analysis subworking group, DNRC has provided definitions for the following terms:

- **Historic consumptive use**: The historical annual volume of water used for a beneficial purpose that does not return to surface water or groundwater. The following dates are applicable in determining what constitutes historical information:
  - Historic information for a statement of claim must be described as it was used prior to July 1, 1973, unless the Water Right Claim was subject to a previous change in which case it is the date of completion of the change;
  - Historic information for a provisional permit must be described as it was used at the filing date of the completion notice;
  - Historic information for a certificate of water right must be described as it was used at the filing date of the completion notice;
  - Historic information for an exempt or nonfiled water right must be described as it was completed prior to July 1, 1973
    - examples of this include (but are not limited to) the volume of water that a) is applied to an irrigation place of use and nutritionally consumed by a crop, b) is applied to an irrigation place of use and lost as evaporation from the surface of a flooded field (5% of applied volume for flooding) or lost as evaporation when it leaves a sprinkler and before it lands on a field (10% of applied volume for sprinkler), c) is conveyed along an earthen ditch that evaporates from the surface or is consumed by vegetation growing immediately along or in a ditch, d) is consumed by livestock, e) evaporates from the surface of a pond or reservoir, or f) is consumed during wastewater treatment (10% for septic). For historical irrigation, the total consumed volume is equal to the sum of the total volume of water nutritionally consumed by a crop and the volume of irrecoverable losses.

- **Historic on-farm efficiency**: the portion of the total volume of water that is delivered then applied onto an irrigation place of use that is *nutritionally consumed by a crop*. For example, for a field that is wild-flood irrigated the standard on-farm efficiency is 25%. This means that of the total annual volume that makes it and then is applied to an irrigated field, 25% of that volume is actually 'taken up' by the crop and *does not* include irrecoverable losses (which are considered consumptive). The remaining non-consumed water is assumed to percolate through the ground and show up later in the form of return flows in nearby surface water sources.
- The following dates are applicable in determining what constitutes historical information:
  - Historic information for a statement of claim must be described as it was used prior to July 1, 1973, unless the Water Right Claim was subject to a previous change in which case it is the date of completion of the change;
  - Historic information for a provisional permit must be described as it was used at the filing date of the completion notice;
  - Historic information for a certificate of water right must be described as it was used at the filing date of the completion notice;
  - Historic information for an exempt or nonfiled water right must be described as it was completed prior to July 1, 1973

- **Historic conveyance losses** (The volume of water historically diverted for irrigation

purposes is calculated as the sum of water historically lost during conveyance to a field and the volume of water applied to a field; additional purposes such as stock, recreation, fishery, etc. may also be considered in this total volume.)

- Seepage loss: The volume of water that is conveyed along an earthen ditch that seeps through the ground before it arrives to a place of use (the Department does not currently assess where this water goes, but it is not considered consumed).
- Vegetation Loss: The volume of water that is conveyed along an earthen ditch that is taken up by non-crop vegetation located within and immediately alongside a ditch before it arrives to a place of use (the Department considers this consumed water).
- Ditch evaporation: The volume of water that is conveyed along an earthen ditch or canal that is lost due to evaporation from the surface of the waterway before it arrives to the place of use (the Department considers this consumed water).

- The following dates are applicable in determining what constitutes historical information:
  - Historic information for a statement of claim must be described as it was used prior to July 1, 1973, unless the Water Right Claim was subject to a previous change in which case it is the date of completion of the change;
  - Historic information for a provisional permit must be described as it was used at the filing date of the completion notice;
  - Historic information for a certificate of water right must be described as it was used at the filing date of the completion notice;
  - Historic information for an exempt or nonfiled water right must be described as it was completed prior to July 1, 1973

- **Irrecoverable losses**: For flood irrigation, 5% of the field application volume is effectively consumed in the form of evaporation from the surface of a flooded field, while 10% of this volume is consumed when it falls from a sprinkler head and evaporates before it hits the crop.

- **Evapotranspiration**: Per the DNRC's IWR memo dated February 4, 2013, "the movement of water to the atmosphere that results from the combination of direct evaporation from soils, plant surfaces, and transpiration from plants." Center pivot sprinklers are more capable of managing soil moisture and keeping it high thus resulting in less effective precipitation necessary to fulfill the total ET demand as determined by the appropriate local weather station for alfalfa (Columns D & E in Table 1, 36.12.1902). Per DNRC's Consumptive Use Methodology memo dated March 17, 2010, the NRCS' Irrigation Water Requirements (IWR) program is used to calculate both the total irrigation season alfalfa **crop requirement** (in inches), and the portion of the total crop requirement that was supplied *by irrigation* rather than precipitation. IWR only estimates the amount of water that a crop needs for ET; it *does not* estimate the amount of water that needs to be delivered to the field (which is equal to the crop irrigation requirement divided by the on-farm irrigation efficiency).

- **Obtainable yield**: Per DNRC's IWR and Consumptive Use memos, total seasonal ET is divided by 6 inches/ton/acre to calculate obtainable yield which represents a production value under circumstances not limited by water or management and is then divided into actual National Agriculture Statistics Service (NASS) county crop production values to determine a **management factor** that is applied to the

maximum seasonal ET. The management factor gives an estimate of what portion of the obtainable yield producers are typically obtaining in their field (though, we note, there are problems with calculating management factors for specific sites when the scale of NASS data reflect county-wide averages). Per DNRC's Consumptive Use Methodology memo, the online NASS database was queried to acquire irrigated alfalfa yields (tons/acre) which have been surveyed by county since 1964, and statewide since 1929.